

SMOKY CANYON MINE
OS3 OS31



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CORPORATE - POCATELLO OFFICE

November 4, 2015

US EPA

NOV 06 2015

IDAHO OPERATIONS OFFICE

Mary Kauffman
USDA Forest Service -- Caribou National Forest
410 East Hooper Street
Soda Springs, Idaho 83276

**Subject: Smoky Canyon Mine Remedial Investigation/Feasibility Study (RI/FS)
Additional Wells Formation Aquifer Investigation in the Panel A Area**

Boring Logs and As-Built Well Construction Logs for GW-29 and GW-30

Dear Mary:

Please find enclosed the Boring Logs and As-Built Well Construction Logs for new monitoring wells GW-29 (Boring ES-MW9) and GW-30. The information for GW-29 is included herein for documentation purposes as requested in your email dated July 21, 2015. For completeness, we are also submitting the information for GW-30.

The J.R. Simplot Company (Simplot) is submitting these documents, in accordance with the August 2009 Settlement Agreement/Consent Order, to address a Wells Formation groundwater data need identified in the northern area of the mine.

The electronic files are available for download at:

<https://smokyrifs.formationclient.com/>

Username: (b) (6)

Password (case sensitive): (b) (6)

Please contact me if you have any questions.

Sincerely,

Monty Johnson
Environmental Engineering Manager

Enclosures

cc: see attached distribution list



SMOKY CANYON MINE – DISTRIBUTION LIST

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Subject: Boring Logs and As-Built Well Construction Logs for GW-29 and GW-30

Date: November 4, 2015

<u>X</u>	Mary Kauffman (1 unbound hard copy) USDA Forest Service Caribou/Targhee National Forest Soda Springs District Office Attn: Smoky Canyon Site Record 410 E. Hooper St. Soda Springs, ID 83276	<u>X</u>	Mary Kauffman (1 hard copy) USDA Forest Service Caribou/Targhee National Forest 1405 Hollipark Drive Idaho Falls, ID 83401
<u>X</u>	James Alexander (1 CD only) USDA Office of the General Counsel 1220 SW Third Avenue Floor G, Room G002 (mail room) Portland, OR 97204	<u>X</u>	Alan Prouty, Burl Ackerman (2 hard copies) J.R. Simplot Company P.O. Box 27, One Capital Center 999 Main Street, Ste 1400 (mail room) Boise, ID 83707-0027
<u>X</u>	Wayne Crowther (1 hard copy) Idaho Dept. of Environmental Quality 444 Hospital Way, Suite 300 Pocatello, ID 83201	<u>X</u>	Monty Johnson (3 hard copies) Dennis Facer, Lori Hamann J.R. Simplot Company P.O. Box 912 1130 West Highway 30 Pocatello, ID 83204
<u>X</u>	Colleen O'Hara-Epperly (1 hard copy) Bureau of Land Management Pocatello Field Office 4350 South Cliffs Drive Pocatello, ID 83204	<u>X</u>	Chad Gentry (email only) Rachel Roskelley, Grant Williams, Dustin Hansen (3 hard copies) J.R. Simplot Company, Smoky Canyon Mine 1890 Smoky Canyon Mine Road Afton, WY 83110
<u>X</u>	Sandi Fisher (1 hard copy) US Fish and Wildlife Service 4425 Burley Drive, Suite A Chubbuck, ID 83202	<u>X</u>	Gary Billman (1 hard copy) Idaho Department of Lands 3563 Ririe Highway Idaho Falls, ID 83401
<u>X</u>	Matt Wilkening (1 hard copy) EPA, Idaho Operations Office 950 W. Bannock St., Suite 900 Boise, ID 83702	<u>X</u>	Kelly Wright (1 hard copy) Env. Waste Mgmt. Program Shoshone-Bannock Tribes P.O. Box 306 Fort Hall, ID 83203
<u>X</u>	Ted Yackulic (1 CD only) EPA Region 10 Office of Regional Counsel (ORC-158) 1200 Sixth Avenue Seattle, WA 98101	<u>X</u>	Susan Hanson (1 hard copy) (b) (6)
<u>X</u>	Brady Johnson (1 hard copy) Idaho Dept. of Environmental Quality 1410 North Hilton Boise, ID 83706	<u>X</u>	Doug Scott (1 CD only) CH2M Hill 59 Lilac Court Pagosa Springs, CO 81147
<u>X</u>	Rick McCormick (2 hard copies) Allan Erickson CH2M Hill 322 East Front Street Suite 200 Boise, ID 83702	<u>X</u>	Fred Charles (3 hard copies) Buz Cotton, Len Mason Formation Environmental, LLC 2500 55 th Street Suite 200 Boulder, CO 80301

NOTE: Each hard copy report includes 1 complete CD

FORMATION

ENVIRONMENTAL

ES-MW9 Pilot Boring Log

(Page 1 of 14)

J.R. Simplot
Smoky Canyon Mine
Caribou County, ID

Date Start/Finish : 7/2 - 7/7/2014
Borehole Diameter : 8"
Drilling Method : Casing Advance and Open Hole
Sampling Method : Cuttings
Drilling Fluid : Air, Water and Foam

Logged By : JPL/LJM
Drilling Company : Thomas Drilling
Ground Elevation : 6971.6' AMSL
Northing (NAD 83) : 4729105 (est)
Easting (NAD 83) : 491103 (est)

Project Number: 009-004

Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

Cover

8" Surface
Casing

(0 - 7.0) - Fill material used to construct pad including topsoil, dark brown to brown, and easy drilling.

Fill

Advancing 8-inch casing using an under-reaming bit.

5

10

(7.0 - 70.0) - Alluvium/Colluvium consisting of root and woody debris quickly grading to a brown silty sand with variable gravel sized fragments composed of gray chert, reddish brown to olive yellow siltstone and sandstone, and gray to light brown limestone. Fragments are subround to subangular, flat and elongated.

Qal/Qco

Begin drilling with water and foam.

15

Variable fragment size from medium to coarse sand to medium to coarse gravel. Variable composition of fragments and trace calcite.

20

25

- Gray and black chert,
- Olive yellow-pale brown siltstone,
- White limestone,
- Light gray siltstone with clacite stringers.

30

35

40

45

50

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

The borehole was left with the 8-inch casing in place and a two foot stick-up with a welded cover.

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ENVIRONMENTAL

ES-MW9 Pilot Boring Log

(Page 2 of 14)

J.R. Simplot
Smoky Canyon Mine
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Date Start/Finish : 7/2 - 7/7/2014
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Project Number: 009-004

Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

50 Variable fragment size from medium to coarse sand to medium to coarse gravel. Variable composition of fragments and trace calcite.

- Gray and black chert,
- Olive yellow-pale brown siltstone,
- White limestone,
- Light gray siltstone with calcite stringers.

Qal/Qco

Rotation smoothing out.

8" Surface
Casing

70 (70.0 - 124.0) - Siltstone, brown to olive yellow, with some very dark brown siltstone fragments. Larger coarse gravel fragments can be broken and scratched with fingers. Some of the large fragments exhibit alternating laminations of olive yellow and dark brown siltstone.

Trdl

Lower Dinwoody Formation (Trdl).

Hammer begins to fire consistently.

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ES-MW9 Pilot Boring Log

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Smoky Canyon Mine
Caribou County, ID

Date Start/Finish : 7/2 - 7/7/2014

Logged By : JPL/LJM

Borehole Diameter : 8"

Drilling Company : Thomas Drilling

Drilling Method : Casing Advance and Open Hole

Ground Elevation : 6971.6' AMSL







Sampling Method : Cuttings

Northing (NAD 83) : 4729105 (est)

Drilling Fluid : Air, Water and Foam

Easting (NAD 83) : 491103 (est)

Project Number: 009-004

Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
100	Siltstone, olive yellow and dark brown, fragments are angular, medium to coarse sand with some coarse gravel.	Trdl		Hammer hitting well.	
105					
110	Larger fragments easily scratched and broken with fingers.				
115		Trdl		May have first encountered water at 120' bgs.	
120	Trace black and gray siltstone fragments, increasing with depth.				
125	(124.0 - 126.0) - Siltstone, 50% olive brown and 50% gray.	Trdl			
130	(126.0 - 150.0) - Shale, gray, that is thinly bedded to laminated. Fragments are well graded, medium to coarse sand size with trace to some gravel sized, and angular. Larger fragments can be broken and scratched with fingers. Fragments react slightly with acid but more vigorously when scratched.	Trdl		Hammer hitting well.	
135					
140					
145		Trdl		Water being produced from borehole, difficult to determine volume because of water being used during drilling.	
150	Trace white calcite and olive brown to brown siltstone fragments.				

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ES-MW9 Pilot Boring Log

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J.R. Simplot
Smoky Canyon Mine
Caribou County, ID

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Sampling Method : Cuttings
Drilling Fluid : Air, Water and Foam

Logged By : JPL/LJM
Drilling Company : Thomas Drilling
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Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

150 (150.0 - 240.0) - Shale, gray, that is thinly bedded to laminated. Fragments are well graded, medium to coarse sand size with trace to some gravel sized, and angular. Larger fragments can be broken and scratched with fingers. Fragments react slightly with acid but more vigorously when scratched.

155

160

165
170 Gray shale with laminations, and trace calcite. Larger gray fragments have calcite stringers through them. Calcite reacts very well with acid.

175

180

185

190

195

200

Trdl

Hammer hitting well.

Formation producing more water with depth.

8" Surface Casing

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

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ES-MW9 Pilot Boring Log

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J.R. Simplot
Smoky Canyon Mine
Caribou County, ID

Date Start/Finish : 7/2 - 7/7/2014

Logged By : JPL/LJM

Borehole Diameter : 8"

Drilling Company : Thomas Drilling

Drilling Method : Casing Advance and Open Hole

Ground Elevation : 6971.6' AMSL

Sampling Method : Cuttings

Northing (NAD 83) : 4729105 (est)

Drilling Fluid : Air, Water and Foam

Easting (NAD 83) : 491103 (est)

Project Number: 009-004

Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
200	Shale, gray, that is thinly bedded to laminated. Fragments are well graded, medium to coarse sand size with trace to some gravel sized, and angular. Larger fragments can be broken and scratched with fingers.			Hammer hitting well.	
205	Fragments react slightly with acid but more vigorously when scratched.			Driller reports that the static water level in the borehole may be as high as 120 feet because of the amount of water in the borehole between casing runs.	
210					
215					
220		Trdl			
225					
230					
235					
240	(240.0 - 245.0) - Shale, olive brown, angular coarse sand size fragments, with trace calcite and gray shale, larger fragments are laminated with black stringers.	Trdl		An abrupt increase in formation water production.	
245	(245.0 - 262.5) - Shale, gray, with variable concentrations of olive brown to brown siltstone and trace calcite. Larger gravel sized fragments absent.	Trdl		Harder drilling.	
250					

8" Surface Casing

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

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ES-MW9 Pilot Boring Log










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Caribou County, ID

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Drilling Company : Thomas Drilling
Ground Elevation : 6971.6' AMSL
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Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
250	Shale, gray, with variable concentrations of olive brown to brown siltstone and trace calcite. Larger gravel sized fragments absent.	Trdl		Abruptly easier drilling.	
255					
260		Trdl		Harder drilling.	
265	(262.5 - 267.0) - Shale, olive brown to brownish yellow, mottled with black blebs and specks. Some gray fragments have a reddish veneer on them. Larger fragments have calcite and limestone stringers.				
270	(267.0 - 307.0) - Shale, gray, with trace calcite and olive brown siltstone. Fragments are angular coarse sand to fine gravel size. Some fragments easily broken with fingers.	Trdl		Hard slow drilling.	
275					
280					
285					
290		Trdl		Water production ~100 to 150 gpm.	
295					
300					

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

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ES-MW9 Pilot Boring Log







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Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
300	Shale, gray, with trace calcite and olive brown siltstone. Fragments are angular coarse sand to fine gravel size.	Trdl			8" Surface Casing
305	Some fragments easily broken with fingers.				
310	(307.0 - 322.0) - Shale, olive with gray fragments, olive fragments increasing with depth, trace coarse gravel sized fragments have calcite veins and stringers through both colors. Olive colored fragments are more easily broken than gray.	Trdl		Hard drilling. Fast drilling, larger cutting fragments. Water production ~150 gpm.	
315	Gray siltstone increasing in concentration with depth.				
320	(322.0 - 346.0) - Shale, gray, with trace to some olive gray to olive siltstone. Both colors of siltstone react vigorously with acid when crushed. Trace calcite and brown siltstone fragments.	Trdl		Hard drilling. Difficult sample recovery because of the volume and velocity of water being discharged.	
325					
330		Trdl		Hard drilling.	
335					
340		Trdl			
345					
350	(346.0 - 383.0) - Alternating beds of gray shale and olive to olive-brown shale with variable concentrations of calcite. Fragment size is an angular coarse sand.	Trdl			

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

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ES-MW9 Pilot Boring Log





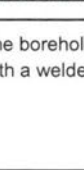



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Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
350	Alternating beds of gray shale and olive to olive-brown shale with variable concentrations of calcite. Fragment size is an angular coarse sand.	Trdl		Continued difficult sample recovery.	
355					
360		Trdl		Hard drilling and water production estimated at 200 gpm.	
365					
370		Trdl			
375					
380		Trdl			
385	(383.0 - 451.0) - Shale, gray, angular coarse sand size fragments with trace medium gravel fragments and trace calcite.				
390		Trdl			
395					
400		Trdl			

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

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Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
400	Shale, gray, angular coarse sand size fragments with trace medium gravel fragments and trace calcite.				8" Surface Casing
405					
410				Hard drilling.	
415					
420					
425	Continued as above.	Trdl			
430					
435					
440					
445					
450	Shale, gray, angular coarse sand size fragments with trace medium gravel fragments and trace calcite.				

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ES-MW9 Pilot Boring Log

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Depth in Feet	DESCRIPTION	USCS	GRAPHIC	REMARKS	Well: ES-MW9 TOC elev.: 6973.6'
450		Trdl			
455	(451.0 - 460.5) - Shale, gray, grading to olive gray siltstone with calcite. Olive gray fragments are larger, coarse gravel size, and have calcite stringers and veins through them. Gray shale increasing with depth.	Trdl		Inconsistent rotation of drill rods.	
460	(460.5 - 505.0) - Shale, gray, angular coarse sand size fragments with trace medium gravel fragments and trace calcite.			Smooth rotation of drill rods. Hard and slow drilling.	
465					
470	Gray shale grading to a darker gray with fragments becoming harder to break between fingers and not easily scratched. When the scratched or crushed the fragments react well with acid.				
475					
480		Trdl			
485					
490				Hard and slow drilling.	
495					
500					

8" Surface
Casing

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ES-MW9 Pilot Boring Log

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Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

500

Gray shale grading to a darker gray with fragments becoming harder to break between fingers and not easily scratched. When the scratched or crushed the fragments react well with acid.

Trdl

505

(505.0 - 655.0) - Shale, gray, medium to coarse sand size fragments, some fine angular gravel sized fragments, fragments are flat and elongated. Larger fragments do not have any indication of bedding or structure. Fragments react weakly with acid unless crushed.

Trdl

Advanced 8-inch casing using casing hammer into formation to seal off water above 500' bgs.

Begin open hole drilling with a 7-7/8 inch tri-cone bit.

Borehole dry from 505' to 540' bgs.

510

515

520

525

530

535

Variable calcite content. Calcite reacts very strongly with acid.

540

Borehole water production ~100 gpm.

545

Rough drilling.

550

8" Surface Casing

Open hole

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ES-MW9 Pilot Boring Log

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550	Shale, gray, medium to coarse sand size fragments, some fine angular gravel sized fragments, fragments are flat and elongated. Larger fragments do not have any indication of bedding or structure. Fragments react weakly with acid unless crushed.			Hard drilling characterized by smooth drilling with occasional rough areas.	
555	Variable calcite concentrations.				
560					
565					
570					
575		Trdl		Water production ~100-150 gpm.	Open hole
580					
585					
590					
595					
600					

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Project Number: 009-004

Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

600 Shale, gray, medium to coarse sand size fragments,
some fine angular gravel sized fragments, fragments
are flat and elongated. Larger fragments do not have
any indication of bedding or structure. Fragments react
weakly with acid unless crushed.

605 Variable calcite concentrations.

610

615

620

625

630

635

640

645

650

Trdl

Hard drilling characterized by
smooth drilling with
occasional rough areas.

Open hole

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

The borehole was left with the 8-inch casing in place and a two foot stick-up with a welded cover.

FORMATION

ENVIRONMENTAL

ES-MW9 Pilot Boring Log

(Page 14 of 14)

J.R. Simplot
Smoky Canyon Mine
Caribou County, ID

Date Start/Finish : 7/2 - 7/7/2014
Borehole Diameter : 8"
Drilling Method : Casing Advance and Open Hole
Sampling Method : Cuttings
Drilling Fluid : Air, Water and Foam

Logged By : JPL/LJM
Drilling Company : Thomas Drilling
Ground Elevation : 6971.6' AMSL
Northing (NAD 83) : 4729105 (est)
Easting (NAD 83) : 491103 (est)

Project Number: 009-004

Depth
in
Feet

DESCRIPTION

USCS

GRAPHIC

REMARKS

Well: ES-MW9
TOC elev.: 6973.6'

650

Shale, gray, medium to coarse sand size fragments, some fine angular gravel sized fragments, fragments are flat and elongated. Larger fragments do not have any indication of bedding or structure. Fragments react weakly with acid unless crushed.

Trdl

655

Variable calcite concentrations.

660

665

670

675

680

685

690

695

700

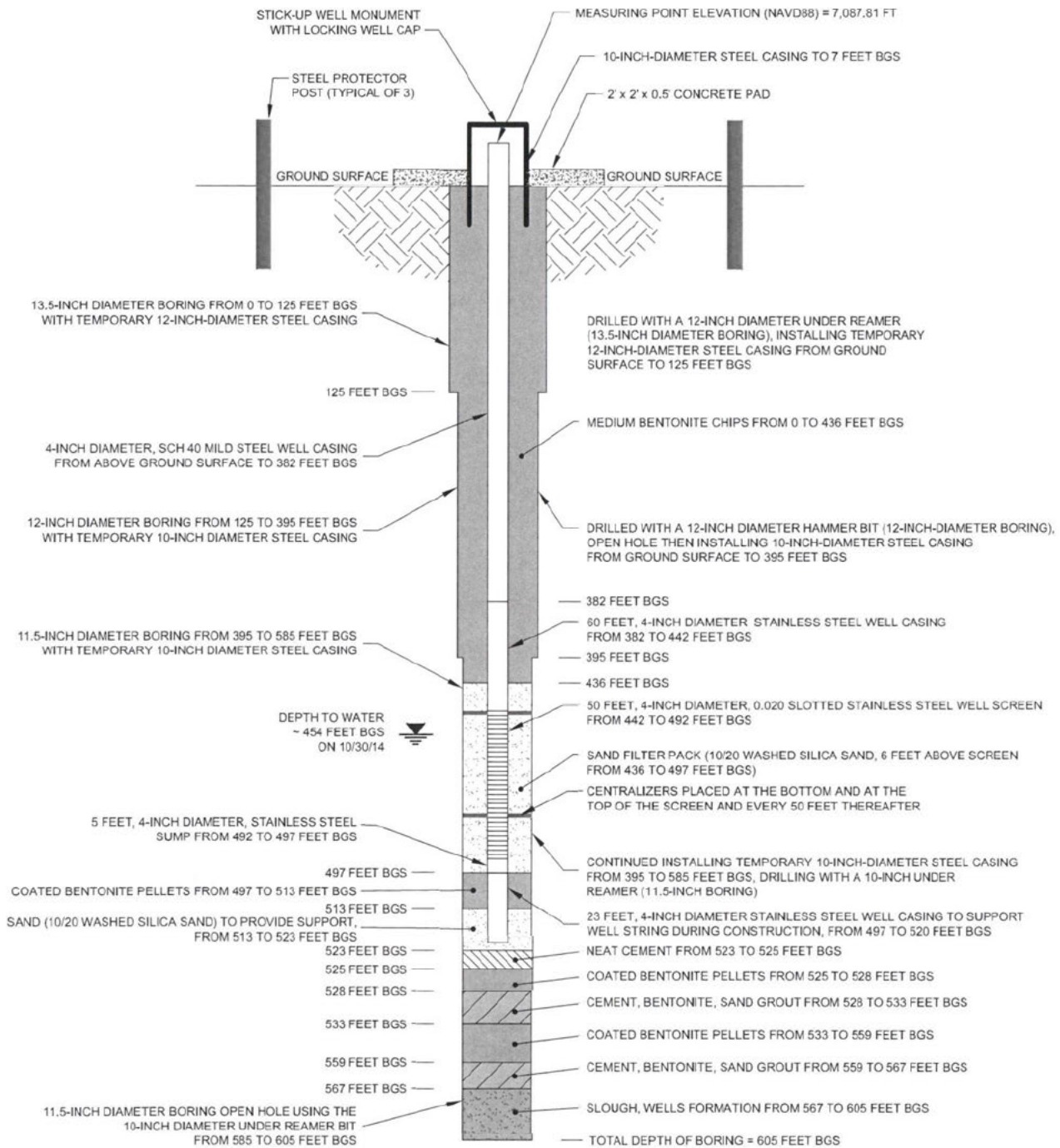


Open hole

On 7/8/14 the WL=163' bgs and the borehole was air-lifted for three hours to remove approximately 6 borehole volumes while monitoring groundwater quality parameters. At the completion of air-lifting a sample was collected and analyzed for the constituents listed on Table 4 of the East Smoky EIS SAP.

The borehole was left with the 8-inch casing in place and a two foot stick-up with a welded cover.

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NOTE: BOREHOLE DRILLED IN OCTOBER 2014; MONITORING WELL CONSTRUCTED IN JULY 2015.

October 2015
203713454



6995 Sierra Center Parkway
Reno, Nevada 89511
www.stantec.com

Client/Project

BLM AND USFS
EAST SMOKY PANEL MINE EIS
CARIBOU COUNTY, IDAHO

Title

MONITORING WELL GW-29
AS-BUILT CONSTRUCTION
SCHEMATIC

Note: Not to Scale



Stantec

LOG OF BORING GW-30

(Page 1 of 3)

BLM and USFS
East Smoky Panel Mine EIS
Caribou County, Idaho

Date Started : 7/29/2015
Date Completed : 8/3/2015
Boring Diameter : 12"
Drilling Contractor : Thomas Drilling
Drilling Method : Air Rotary

Sampling Method : See Reports
Ground Elevation : 7124 ft NAVD88
Total Depth : 534.5 ft
Logged By : Dana Hutchins

Depth in Feet	Rock Type (see key)	GRAPHIC	DESCRIPTION
0	CO		0-28' COLLUVIUM (CO), consists of 40-85% gravel, 5-40% fines, and 10-20% sand. Clasts composed of light reddish brown (5YR4/6 Munsell) SANDSTONE with trace LIMESTONE, black CHERT, and DOLOMITE.
20	LS-SS-CL		28-35' 80% LIMESTONE (LS), 10% SANDSTONE (SS), and 10% CLAY (CL), light gray to tan (LS), light brown (7.5YR 7/4 Munsell) (SS) and (CL). Limestone has undergone partial dolomitization and contains trace quartz crystals.
40	SS		35-40' 100% SANDSTONE (SS), light tan (7.5YR7/4 Munsell), composed of large sand-sized grains of quartz.
60	SS-LS		40-55' 50% SANDSTONE (SS) and 50% DOLOMITIC LIMESTONE (LS), light tan (SS), light gray (LS), with trace amounts of black CHERT.
80	SS		55-70' 100% SANDSTONE (SS), light tan (7.5YR7/4 Munsell), with trace LIMESTONE and CHERT, cuttings are subangular and 1-15 mm in diameter.
100	LS-SS		70-80' 80% LIMESTONE (LS) and 20% SANDSTONE (SS), light gray (LS), light tan (SS). Cuttings are subrounded to subangular and 1-15 mm in diameter.
120	LS		80-145' 100% SANDY DOLOMITIC LIMESTONE (LS), light gray (5Y7/1 to 5Y8/2 Munsell), Cuttings are subangular to angular and 1-10 mm in diameter.
140	LS		90-95' Some weathered edges and trace black CHERT.
160	LS-SS		140-145' Trace black CHERT.
180	LS-SS		145-165' 50% SANDY LIMESTONE (LS) and 50% CALCARIOUS SANDSTONE (SS), light gray (5Y7/2 Munsell) (LS), light tan (5Y8/4 Munsell) (SS). Cuttings are subrounded and 1-15 mm in diameter.
200	LS		160-165' Contains 20% light tan CLAY.
	LS		165-185' 100% LIMESTONE (LS), light gray (5Y6/1 Munsell), some weathered edges. Cuttings are subangular and 2-8 mm in diameter.
	LS		185-200' 50-60% LIMESTONE (LS) and 40-50% SANDY LIMESTONE (LS), light gray (5Y7/1 Munsell) (LS), light tan (2.5Y6/6 Munsell) (SANDY LS). Cuttings are subangular to subrounded and 1-15 mm in diameter.

Note:
bgs = below ground surface
mm = millimeter
ft = feet
gpm = gallons per minute

Depth to water was 488.45' bgs on 8-11-15.
Borehole produced 10-15 gpm prior to well installation.



LOG OF BORING GW-30

(Page 2 of 3)

BLM and USFS
East Smoky Panel Mine EIS
Caribou County, Idaho

Date Started : 7/29/2015
Date Completed : 8/3/2015
Boring Diameter : 12"
Drilling Contractor : Thomas Drilling
Drilling Method : Air Rotary

Sampling Method : See Reports
Ground Elevation : 7124 ft NAVD88
Total Depth : 534.5 ft
Logged By : Dana Hutchins

Depth in Feet	Rock Type (see key)	GRAPHIC	DESCRIPTION
200	LS		200-280' 100% LIMESTONE (LS), light gray (5Y7/1 Munsell), Cuttings are subangular and 1-5 mm in diameter.
220			
240			250-255' Cuttings are flat.
260			260-265' Contains 40% quartz crystals.
280			270' Some SANDY LIMESTONE. 270-280' Drilling is much harder.
280	LS-SS		280-290' 50-80% LIMESTONE (LS), 20-50% SANDSTONE (SS), light gray (5Y7/1 Munsell) (LS), light tan (10YR7/6 Munsell) (SS), trace black CHERT. Cuttings are subrounded to subangular and 1-10 mm in diameter.
300	LS		290-370' 100% SANDY LIMESTONE (LS), light gray (5Y7/1 Munsell) to light tan (10YR8/3), contains some weathered edges, weak to strong reaction to HCL. Cuttings are subangular and 1-5 mm in diameter.
320			
340			
360			350-355' Increase in sand content.
380	LS		370-400' 100% LIMESTONE (LS), light gray (5Y7/1 Munsell) to gray (5Y5/1 Munsell), trace black CHERT, some weathered edges. Cuttings are angular to subangular and 1-4 mm in diameter.
400			

Note:

bgs = below ground surface
mm = millimeter
ft = feet
gpm = gallons per minute

Depth to water was 488.45' bgs on 8-11-15.

Borehole produced 10-15 gpm prior to well installation.



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LOG OF BORING GW-30

(Page 3 of 3)

BLM and USFS
East Smoky Panel Mine EIS
Caribou County, Idaho

Date Started : 7/29/2015
Date Completed : 8/3/2015
Boring Diameter : 12"
Drilling Contractor : Thomas Drilling
Drilling Method : Air Rotary

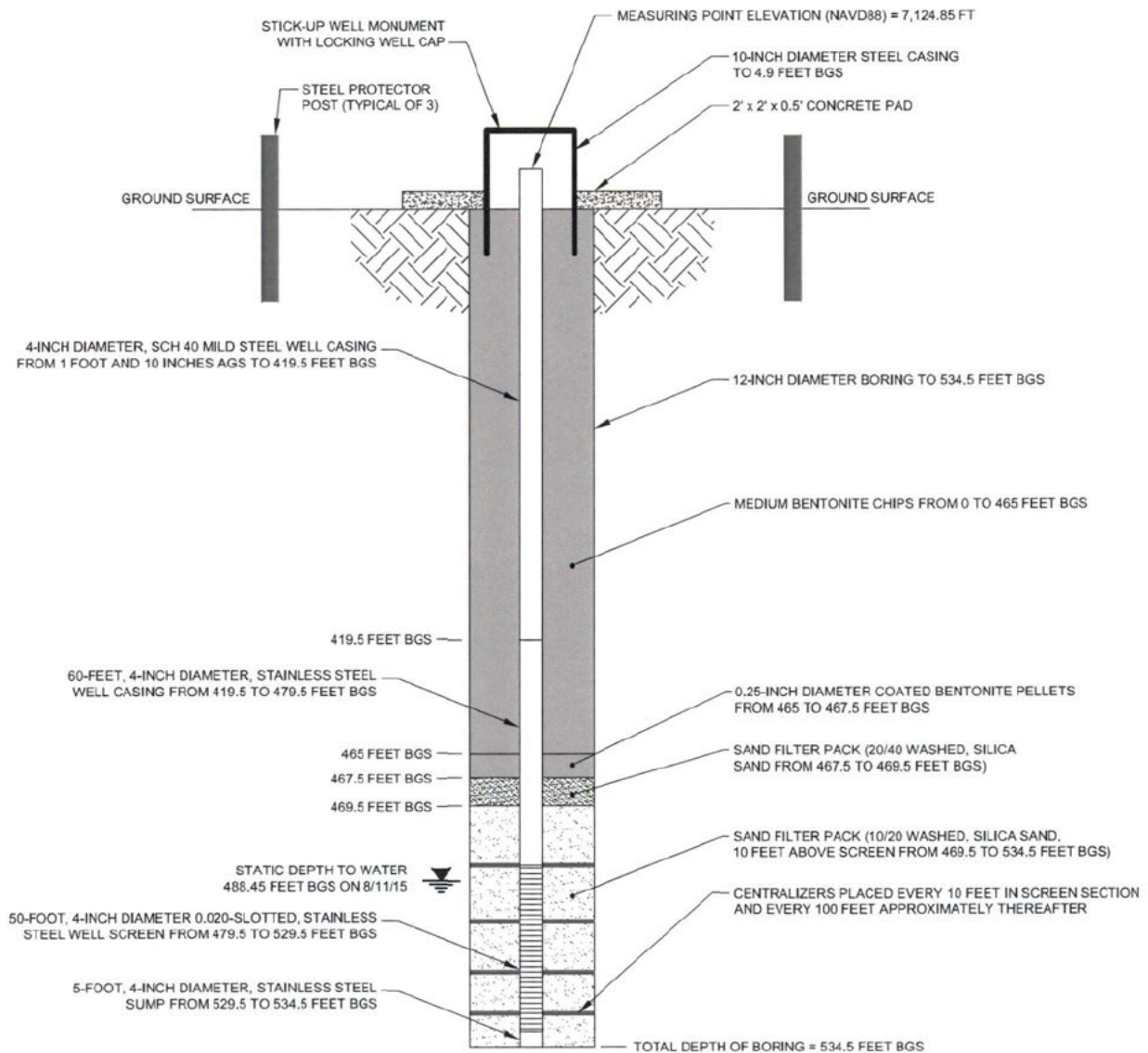
Sampling Method : See Reports
Ground Elevation : 7124 ft NAVD88
Total Depth : 534.5 ft
Logged By : Dana Hutchins

Depth in Feet	Rock Type (see key)	GRAPHIC	DESCRIPTION
400	LS		400-445' 100% SANDY LIMESTONE to LIMESTONE (LS), light gray to light tan (10YR8/2 Munsell), trace black CHERT. Cuttings are subangular to angular and 2-8 mm in diameter.
420			410-415' Apparent fractured zone indicated by large angular cuttings.
440			
460	LS-CH		445-465' 30-80% LIMESTONE (LS), 20-40% CHERT (CH), and 0-30% SANDY LIMESTONE (LS), light gray to gray (5Y6/1 Munsell) (LS), black (CH), light tan (10YR8/2 Munsell) (SANDY LS). Cuttings are angular to subangular and 1-5 mm in diameter.
480	DO-LS		465-525' 100% DOLIMITE to DOLIMITIC LIMESTONE (DO-LS), light gray to light tan (10YR8/4 Munsell), trace balck CHERT. Cuttings are angular to subangular and 1-8 mm in diameter.
500			First water observed at 495' bgs. Flow was estimated using recharge of first observed water in boring during drilling following airlifting at 0.09 gpm on 8-2-2015 when bottom of boring was at 495' bgs.
520			
540	LS-CH		525-534.5' 60% LIMESTONE (LS) and 40% CHERT (CH), light tan to gray (10YR6/2 Munsell) (LS), black (CH), contains some secondary quartz veins. Cuttings are angular and 2-10 mm in diameter.
560	Bottom of boring is at 534.5' bgs. Flow was estimated at 10-15 gpm during air lift test prior to well installation.		
580	Note: Daily drilling footage summary: 0-85 ft bgs drilled on July 29, 2015; 85-225 ft bgs drilled on July 30, 2015; 225-345 ft bgs drilled on July 31, 2015; 345-465 ft bgs drilled on Aug 1, 2015; 465-500 ft bgs drilled on Aug 2, 2015; 500-534.5 ft bgs drilled on Aug 3, 2015.		
600			

Note:
bgs = below ground surface
mm = millimeter
ft = feet
gpm = gallons per minute

Depth to water was 488.45' bgs on 8-11-15.
Borehole produced 10-15 gpm prior to well installation.

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October 2015
203713454



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Client/Project

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EAST SMOKY PANEL MINE EIS
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Title

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Note: Not to Scale